

## PATENT

**AMENDMENTS TO THE CLAIMS**

Following is a complete set of claims as amended with this Response. This complete set of claims excluded cancelled claims 1, 3-6, 11-15, 20-22, 24, 25, and 30 and includes amended claims 2, 10, 19, 26, and 27-29.

1. (Cancelled)

2. (Currently Amended) The device of Claim 4 26, wherein the implantable delivery device comprises at least one lead adapted to be implanted adjacent the heart of a patient so as to permit the delivery of high voltage therapeutic waveforms to the heart of the patient.

3. (Cancelled)

4. (Cancelled)

5. (Cancelled)

6. (Cancelled)

7. (Previously Presented) An implantable medical device that delivers high voltage therapeutic signals to an organ of a patient, the device comprising:

an implantable delivery device that delivers the high voltage therapeutic signals to the organ of the patient;

a battery;

a converter coupled to the battery and to the implantable delivery device wherein the converter comprises at least one bypass capacitor and a switching network, wherein the at least one bypass capacitor is selectively connected to the battery via the switching network, wherein the converter further comprises at least one delivery capacitor that is coupled to the implantable delivery device;

## PATENT

a controller that induces the converter to change between a quiescent period and a charging cycle wherein the at least one bypass capacitor is connected to the battery during the charging cycle such that charge is accumulated in the bypass capacitor, wherein the delivery capacitor is also charged during the charging cycle based on the charge in the at least one bypass capacitor, and wherein the controller further controls the converter to disconnect the at least one bypass capacitor from the battery after completion of the charging cycle to reduce undesired dissipation of battery energy as a result of leakage currents during the quiescent period of the converter;

wherein the converter comprises a transformer having a primary winding and a secondary winding wherein the switching network periodically connects the battery and the at least one bypass capacitor to the primary winding of the transformer so as to produce changing current in the primary winding that results in inductively induced changing current in the secondary winding and wherein the at least one delivery capacitor is connected to the secondary winding of the transformer such that the changing current results in the delivery of charge to the at least one delivery capacitor;

wherein the switching network comprises a first switching element that is interposed between the at least one bypass capacitor, the battery and the primary winding of the transformer and wherein the controller induces the delivery of a high frequency signal to the first switching element so as to periodically connect the at least one bypass capacitor and the battery in parallel to the primary winding of the transformer;

wherein the switching network further comprises a second switching element that connects the at least one bypass capacitor to the battery wherein the controller induces the second switching element to disconnect the at least one bypass capacitor from the battery during the quiescent periods of the converter;

wherein the first and second switching elements comprise transistors having gates and wherein the controller applies an oscillating signal to the first transistor; and

a rectifying element that is interposed between the source of the oscillating signal and the second transistor such that when the oscillating signal is

## PATENT

produced, the second transistor receives a substantially constant input voltage that turns on the transistor.

8. (Previously Presented) The device of Claim 26, further comprising a dissipation element that is interposed between the rectifying element and the battery such that, when the oscillating signal is not produced, the voltage on the gate of the transistor is turned off more quickly as a result of the voltage being dissipated through the dissipation element.

9. (Original) The device of Claim 8, wherein the rectifying element comprises a zener diode and the dissipation element comprises a resistor.

10. (Currently Amended) The device of Claim 4 26, wherein the at least one bypass capacitor comprises a plurality of ceramic capacitors and the at least one delivery capacitor comprises a plurality of electrolytic capacitors.

11. (Cancelled)

12. (Cancelled)

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Previously Presented) An implantable cardiac stimulation device comprising:

at least one lead adapted to be positioned adjacent the heart of the patient to thereby permit delivery of a high voltage therapeutic signal;

a battery that produces a low voltage output;

a converter that comprises at least one bypass capacitor and at least one delivery capacitor wherein the converter in a charging cycle receives the low voltage output of the battery and charges the at least one bypass capacitor and wherein charge

## PATENT

is periodically delivered to the at least one delivery capacitor during the charging cycle such that the at least one delivery capacitor is charged to be able to deliver the high voltage therapeutic signal;

a controller that determines the state of charge of the at least one delivery capacitor and induces the converter to enter the charging cycle when the controller determines that the at least one delivery capacitor is in need of charge to be able to deliver the high voltage therapeutic signal and wherein the controller disconnects the at least one bypass capacitor from the battery when the controller determines that the at least one delivery capacitor is not in need of charge to thereby inhibit undesired dissipation of battery energy as a result of leakage currents in the at least one bypass capacitor;

wherein the converter comprises a transformer having a primary winding and a secondary winding wherein the battery and the at least one bypass capacitor are periodically connected to the primary winding of the transformer so as to produce changing current in the primary winding that results in inductively induced changing current in the secondary winding and wherein the at least one delivery capacitor is connected to the secondary winding of the transformer such that the changing current results in the delivery of charge to the at least one delivery capacitor;

wherein the converter comprises a first switching element that is interposed between the at least one bypass capacitor, the battery and the primary winding of the transformer and wherein the controller induces the delivery of an alternating signal to the first switching element so as to periodically connect the at least one bypass capacitor and the battery to the primary winding of the transformer;

wherein the converter further comprises a second switching element that connects the at least one bypass capacitor to the battery wherein the controller induces the second switching element to disconnect the at least one bypass capacitor from the battery when the converter is not in the charging cycle;

wherein the first and second switching elements comprise transistors and wherein the controller induces the application of the alternating signal to the first transistor; and

## PATENT

a rectifying element that is interposed between the source of the alternating signal and the second transistor such that when the alternating signal is produced, the second transistor receive a substantially constant input voltage that turns on the second transistor.

17. (Previously Presented) The device of Claim 27, further comprising a dissipation element that is interposed between the rectifying element and the battery such that when the alternating signal is not produced, the voltage on the gate of the second transistor is turned off more quickly as a result of the voltage being dissipated through the dissipation element.

18. (Original) The device of Claim 17, wherein the rectifying element comprises a zener diode and the dissipation element comprises a resistor.

19. (Currently Amended) The device of Claim ~~14~~ 27, wherein the at least one bypass capacitor comprises a plurality of ceramic capacitors and the at least one delivery capacitor comprises an electrolytic capacitor.

20. (Cancelled)

21. (Cancelled)

22. (Cancelled)

23. (Cancelled)

24. (Cancelled)

25. (Cancelled)

## PATENT

26. (Currently Amended) ~~The device of claim 6, further comprising~~ An implantable medical device that delivers high voltage therapeutic signals to an organ of a patient, the device comprising:

an implantable delivery device that delivers the high voltage therapeutic signals to the organ of the patient;

a battery;

a converter coupled to the battery and to the implantable delivery device wherein the converter comprises at least one bypass capacitor and a switching network, wherein the at least one bypass capacitor is selectively connected to the battery via the switching network, wherein the at least one bypass capacitor has a capacitance on the order of 20-50 microfarads, and wherein the converter further comprises at least one delivery capacitor that is coupled to the implantable delivery device;

a controller that induces the converter to change between a quiescent period and a charging cycle wherein the at least one bypass capacitor is connected to the battery during the charging cycle such that charge is accumulated in the bypass capacitor, wherein the delivery capacitor is also charged during the charging cycle based on the charge in the at least one bypass capacitor, and wherein the controller further controls the converter to disconnect the at least one bypass capacitor from the battery after completion of the charging cycle to reduce undesired dissipation of battery energy as a result of leakage currents during the quiescent period of the converter;

wherein the converter comprises a transformer having a primary winding and a secondary winding wherein the switching network periodically connects the battery and the at least one bypass capacitor to the primary winding of the transformer so as to produce changing current in the primary winding that results in inductively induced changing current in the secondary winding and wherein the at least one delivery capacitor is connected to the secondary winding of the transformer such that the changing current results in the delivery of charge to the at least one delivery capacitor;

wherein the switching network comprises a first switching element that is interposed between the at least one bypass capacitor, the battery and the primary winding of the transformer and wherein the controller induces the delivery of a high

## PATENT

frequency signal to the first switching element so as to periodically connect the at least one bypass capacitor and the battery in parallel to the primary winding of the transformer;

wherein the switching network further comprises a second switching element that connects the at least one bypass capacitor to the battery wherein the controller induces the second switching element to disconnect the at least one bypass capacitor from the battery during the quiescent periods of the converter;

wherein the first and second switching elements comprise transistors having gates and wherein the controller applies an oscillating signal to the first transistor; and

a rectifying element that is interposed between the source of the oscillating signal and the second transistor such that when the oscillating signal is produced, the second transistor receives a substantially constant input voltage that turns on the transistor.

27. (Currently Amended) ~~The device of Claim 15, further comprising~~ An implantable cardiac stimulation device comprising:

at least one lead adapted to be positioned adjacent the heart of the patient to thereby permit delivery of a high voltage therapeutic signal;

a battery that produces a low voltage output;

a converter that comprises at least one bypass capacitor and at least one delivery capacitor, wherein the converter in a charging cycle receives the low voltage output of the battery and charges the at least one bypass capacitor, wherein the at least one bypass capacitor has a capacitance on the order of 20-50 microfarads, and wherein charge is periodically delivered to the at least one delivery capacitor during the charging cycle such that the at least one delivery capacitor is charged to be able to deliver the high voltage therapeutic signal;

a controller that determines the state of charge of the at least one delivery capacitor and induces the converter to enter the charging cycle when the controller determines that the at least one delivery capacitor is in need of charge to be able to deliver the high voltage therapeutic signal and wherein the controller disconnects the at

## PATENT

least one bypass capacitor from the battery when the controller determines that the at least one delivery capacitor is not in need of charge to thereby inhibit undesired dissipation of battery energy as a result of leakage currents in the at least one bypass capacitor;

wherein the converter comprises a transformer having a primary winding and a secondary winding wherein the battery and the at least one bypass capacitor are periodically connected to the primary winding of the transformer so as to produce changing current in the primary winding that results in inductively induced changing current in the secondary winding and wherein the at least one delivery capacitor is connected to the secondary winding of the transformer such that the changing current results in the delivery of charge to the at least one delivery capacitor;

wherein the converter comprises a first switching element that is interposed between the at least one bypass capacitor, the battery and the primary winding of the transformer and wherein the controller induces the delivery of an alternating signal to the first switching element so as to periodically connect the at least one bypass capacitor and the battery to the primary winding of the transformer;

wherein the converter further comprises a second switching element that connects the at least one bypass capacitor to the battery wherein the controller induces the second switching element to disconnect the at least one bypass capacitor from the battery when the converter is not in the charging cycle;

wherein the first and second switching elements comprise transistors and wherein the controller induces the application of the alternating signal to the first transistor; and

a rectifying element that is interposed between the source of the alternating signal and the second transistor such that when the alternating signal is produced, the second transistor receives a substantially constant input voltage that turns on the second transistor.

28. (Currently Amended) The device of Claim 4 26, wherein the at least one bypass capacitor is a high frequency filter.



PATENT

29. (Currently Amended) The device of Claim ~~11~~ 27, wherein the at least one bypass capacitor is a high frequency filter.

30. (Cancelled)